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Meta-analysis of the effectiveness of online cognitive-behavioral therapy in the treatment of post-traumatic stress disorder

Hamed Ghiasi[1], Fatemeh Askarirostami [2], Maryam Bakhtiari [3*], Saba Hasanvandi[4]

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Authors' Affiliation:
[1]Ph.D of clinical psychology, Department of clinical psychology, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran. E-mail: ghiasi.hamed@yahoo.com, ORCID: orcid.org/0000-0001-6639-4151
[2]Master of Social Work, Yazd Universitty, Yazd, Iran. E-mail: fateme.askarirostami@yahoo.com ORCID: orcid.org/0000-0002-5025-9681
[3]Professor of Clinical Psychology, Department of Clinical Psychology, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran. E-mail: Maryam_bakhtiyari@sbmu.ac.ir ORCID: orcid.org/0000-0002-5106-9775
[4]Ph.D of educational Psychology, Department of Educational Psychology, Faculty of Education Sciences and Psychology, AL Zahra University, Tehran, Iran. E-mail: S.hasanvandi@alzahra.ac.ir ORCID: orcid.org/0000-0002-9920-9781

***Correspondent author:**
Maryam Bakhtiari: Professor of Clinical Psychology, Department of Clinical Psychology, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran. E-mail: maryam_bakhtiyari@sbmu.ac.ir ORCID: orcid.org/0000-0002-5106-9775

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ABSTRACT

Objective: Online cognitive-behavioral therapy has presented great potential for easy, cost-effective, and modern treatments for the psychiatric disorders. The purpose of this study was to review studies in the field of online cognitive-behavioral therapies for post-traumatic stress disorder. *Methods*: In this meta-analysis, 19 studies were included by reviewing related literature to clinical trials in the field of online cognitive-behavioral therapy for post-traumatic stress disorder. The research instrument was the JBI Controlled Critical Appraisal Checklist. *Results*: 19 clinical trials with a sample size of 1324 people were included in study. The results showed that online intervention based on statistical evidence is an acceptable method for treatment of PTSD and compared to control group, the experimental group obtained higher scores (WMD = 0.12 / I-Squared = 67.5%). *Conclusion*: It seems that online cognitive-behavioral interventions are appropriate cost-effective and acceptable therapies of the present age. More studies are required to examine the strengths and weaknesses of online or web-based interventions critically.

Keywords: Cognitive-Behavioral Therapy, Online, Web-Based, Post-Traumatic Stress Disorder

1. INTRODUCTION

The developments of science, technology, and knowledge in the new era, besides the current circumstances of the 21st century, have changed communication and technology in the field of medicine. New lifestyle changes and the increasing use of cyberspace have led many professions, including psychologists, to provide online health care. Also, the needs of clients and the spread of mental health problems in society have increased the number of psychological service clients. According to many sources, 23% of the world population suffers from psychological disorders (Rahimi-Movaghar et al.,

2014). However, due to lack of access, the high cost of psychological services, stigma, etc., a large percentage of patients never go to a mental health service center or they go to a therapist and the health care system with a deterioration of their mental state that challenges the therapist and the treatment system. Thus, a many of potential clients have psychiatric disorders including mood disorders, anxiety disorders, personality disorders, and psychotic disorders, and only a percentage of them seek psychological treatment.

Cognitive-behavioral therapies are among the interventions that can be applied to a wide range of disorders face to face and virtually. In behavioral cognitive methodology, the patient is encouraged to use the relationship between negative spontaneous thoughts and feelings of depression as hypotheses to be tested and behaviors resulting from negative spontaneous thoughts as a criterion for assessing the validity or correctness of those thoughts. This form of treatment, which is used online in cyberspace through global messengers, includes the evaluation, diagnosis, and treatment of a range of anxiety disorders, including Post-Traumatic Stress Anxiety (Oei et al., 2008).

Over the last ten years, the study of research texts has introduced the term "Interapy" which means internet-based therapy, to the research literature in this field. Also, the term "Internet-based Cognitive Behavioral Therapy" (ICBT) was added. In this new form of intervention, screening, treatment, and evaluation of the intervention are performed without face-to-face communication and face-to-face interaction. This process takes place in secure cyberspace, and conversations between the therapist and clients are easily facilitated on *Skype*, chat rooms, *WhatsApp*, or any other secure media. Moreover, CBT assignment is adapted to the Internet in an appropriate format and given to clients. The therapist increases the effectiveness of treatment by supporting, interpreting, giving feedback, and using motivational techniques. In addition, the therapist uses client feedback to interpret and analyze their understanding of the treatment. Online CBT techniques include increasing client motivation for treatment, Unity healing (expressing empathy and understanding), and increasing self-esteem and self-efficacy. Online CBT treatments are short but accurate and targeted, and duration of treatment is between 5 and 16 weeks, during which the therapist receives feedback from clients twice a week (Ruwaard et al., 2011).

There are different points of view regarding online CBT treatment and the advantages of using this new form of treatment have been discussed. The benefits of using ICBT include ease of Internet access, no client inhibition, reflection and introspection (typing words provides time for self-reflection and self-reflection when clients and therapist are talking), writing emotions, Telepresence, therapeutic use of Internet facilities including sending videos, clips, music, documents and files of evaluation methods. In addition to the advantages of this method, there are also disadvantages to this new method of treatment. Lack of visual communication (in spaces where there is no use of webcam), misinterpretation and misinterpretation (conveying concepts through words hinders the process of transmission and unity healing, delay in responding to email, lack of Internet and computer skills, crisis interventions, cultural differences, lack of guarantee of accurate identification of clients and cyberspace security (Markowitz 2003).

A review of literature on ICBT, confirms a decade-long effort by researchers following a cognitive and behavioral therapy approach to the treatment of disorders such as depression, post-traumatic stress disorder (PTSD), grief, work-related stress, panic, and bulimia (Hirai et al., 2005; Knaevelsrud et al., 2007; Lange et al., 2003; Lange et al., 2010; Lange et al., 2001; Markowitz 2003; Mouthaan et al., 2013; Ruggiero et al., 2006; Ruwaard et al., 2007; Ruwaard et al., 2009; Steinmetz et al., 2012; Van Voorhees 2010; Wagner et al., 2006). PTSD has been one of disorders targeted by online therapies including ICBT (Engel et al., 2015; Ivarsson et al., 2014; Knaevelsrud et al., 2007; Krupnick et al., 2017; Kuhn et al., 2017; Lange et al., 2003; Lange et al., 2010; Lange et al., 2001; Lewis et al., 2017; Littleton et al., 2012; Litz et al., 2007; Miner et al., 2016; Spence et al., 2011). Trauma-Focused Cognitive Behavioral Therapy (TF-CBT) has been widely considered as a preferred option (Bisson et al., 2013). TF-CB provides conditions for PTSD clients to challenge their thoughts, beliefs, and behaviors, and includes homework, psychological training, relaxation, and stress management (Roberts et al., 2016). A decade in the implementation of TF-CBT protocols, significant progress has been made in improving and facilitating the protocol implementation process, but there are some limitations, such as the lack of qualified and experienced therapists (Lovell et al., 2000). Also, in the process of implementing TF-CBT, it is usually difficult to agree to hold a face-to-face meeting every few months, and such face-to-face meetings are usually not held (Knaevelsrud et al., 2007). For treatment of PTSD, cognitive-behavioral interventions have taken a turbulent path. By examining two groups of people with this disorder with CBT protocol components, the researchers showed a significant effect on improving symptoms after 8 sessions and presenting and evaluating homework (Lange et al., 2001). In other cases, including those who had been sexually abused, online cognitive therapy reduced PTSD symptoms.

In these studies, which were performed on samples of young girls between 16-25 years, there is several evidence of the effectiveness of ICBT (Lange et al., 2003). Other studies have targeted work-related stressors and stressors of work burnout. For example, in controlled clinical trials, researchers have shown that by using the hidden opportunities of cyberspace, it is possible to reduce the stress associated with employees' work by using cognitive-behavioral techniques (Ruwaard et al., 2007).

Most Meta-analyses of PTSD psychological therapies focus on the effectiveness and application of therapies (Bisson et al., 2013; Szafranski et al., 2017) and quantitative meta-analyses focus on ICBT acceptance, treatment expectations, treatment preferences, and patient satisfaction in treatment of disorders like PTSD (Campos et al., 2018). With the new attention to cyberspace features, cost-effectiveness, easy and cheap access to cyberspace, a new path has been opened in online or internet-based psychological services. Therefore, it seems that the acceptability of ICBT for PTSD should be further investigated considering the novelty of this form of treatment (Wallin et al., 2016). Due to the need to expand psychological services in the community and identify the strengths and weaknesses of this new form of treatment, this study seeks a systematic review and meta-analysis of clinical studies in online cognitive-behavioral therapy for PTSD.

2. METHODS

According to the aim of the study, a meta-analysis method has been used. In a meta-analysis, the basic principle is to calculate the effect size for separate studies and return them to a common matrix and then combine them to achieve the mean of the effect(Simon et al., 2019). The effect size indicates the amount or degree of presence of a phenomenon in society, and the larger effect size is, the greater the degree of the presence of the phenomenon is (Higgins 2008; Moher et al., 2009; Rochlen et al., 2004; Simon et al., 2019).

Effect size is the main concept in meta-analysis and shows the amount of relationship between one variable and another in a standard way. The statistical population of the study was all English articles that have been published during the last 10 years (2011-2021) in the field of online cognitive-behavioral Works for treatment of a wide range of psychiatry disorders. For this purpose, to extract related articles to the desired field, various databases such as *Scopus, Google Scholar, Web of Science, PubMed, Google Scholar Cochrane Library, Arts & Humanities Citation Index (A & HCI), Social Sciences Citation Index (SSCI), Conference Proceedings Citation Index – Science (CPCI-S), Science Citation Index Expanded (SCI-Expanded), Conference Proceedings Citation Index – Social Sciences &, Humanities (CPCI-SSH), Index Chemicus (IC), and Persian electronic databases (ie, , SID, Magiran IranMedex, Irandoc,* were used. Also, to download all published articles, following keywords was searched: *Online therapy, Online CBT Online treatment, Wave of online therapy, Internet Cognitive Behavioral Treatment, Interapy.*

Also, all the references of extracted articles were checked. There is the search strategy in different databases in Figure 1. The researchers, having gathered all the relevant information to the subject in question, examined articles that had not yet been published or, in other words, were being published (Gray Literatures). The Duplicate articles were removed and approved articles were evaluated by abstract and title based on the Critical Evaluation Checklist of JBI (The Joanna Briggs Institute) for randomized clinical trials. Inclusion criteria included: methodological appropriateness (hypothesis making, type of research method, statistical population and sampling method, validity, and reliability of scales used and statistical analysis in accordance with research hypotheses), clinical trial, type of treatment specifically cognitive-behavioral interventions, and the diagnosis of clients with one of the psychiatric disorders based on DSM-5. Finally, to evaluate the quality of control applied to the extracted articles, two authors re-evaluated all the articles. The range of assessment scores ranged from 55% - 100%. The low scores Articles (score <60, n = 3) were excluded from the analysis. It should be noted that the disagreement among the researchers on the quality evaluation of the articles was resolved by the third researcher and the consent of the other parties. In order to ensure the entry and analysis of all related articles in this field, the searches were conducted in general once again. The final search was performed on 2021-03-28 (table 1). Therefore, all studies related to keywords were included in the study. The PRISMA flowchart is presented in Figure 1 to show the number of articles identified in the initial search and the process of identifying the final study articles. All articles were reviewed by two researchers quite separately (see table 1 and Figure 1).

Table 1: Characteristics of the clinical trials included in the meta-analysis based on eligibility criteria

First author of article	diagnose	Experimental condition	Number	evaluation scales	media type evaluation scales
Lange 2001	PTSD	experiment	13	IES	Skype
		Control	12		
Lange 2003	PTSD	experiment	122	IES	Skype
		Control	62		
Knaevelsrud 2007	PTSD	experiment	49	IES	WhatsApp
		Control	47		
Lange 2010	PTSD	experiment	24	IES	WhatsApp
		Control	35		

Engel 2015	PTSD	experiment	33	IES	WhatsApp and e-mail
		Control	33		
Ivarsson 2014	PTSD	experiment	25	IES	Skype
		Control	25		
Krupnick 2017	PTSD	experiment	19	IES	WhatsApp
		Control	13		
Kuhh 2017	PTSD	experiment	21	IES	WhatsApp and e-mail
		Control	20		
Lewis 2017	PTSD	experiment	34	IES	WhatsApp
		Control	31		
Littelton 2012	PTSD	experiment	34	IES	WhatsApp
		Control	42		
Itz 2007	PTSD	experiment	12	IES	Skype
		Control	19		
Miner 2016	PTSD	experiment	20	IES	WhatsApp
		Control	23		
Spence 2011	PTSD	experiment	17	IES	WhatsApp
		Control	23		
Hirai and Clum 2005	PTSD	experiment	26	IES	WhatsApp
		Control	29		
Mouthaan et al 2013	PTSD	experiment	177	IES	Skype
		Control	62		
Ruggiero et al 2006	PTSD	experiment	36	IES	WhatsApp
		Control	18		
Steinmetz et al 2012	PTSD	experiment	27	IES	Skype
		Control	31		
Van Voorhees et al 2012	PTSD	experiment	35	IES	WhatsApp
		Control	35		

NOTE: IES: Impact of Event Scale; PDSS-SR: Panic Disorder Severity Scale, Self-rate; BDI: Beck Depression Inventory; EDE-Q: Eating Disorder Examination-Questionnaire; DASS: Depression Anxiety Stress Scales.

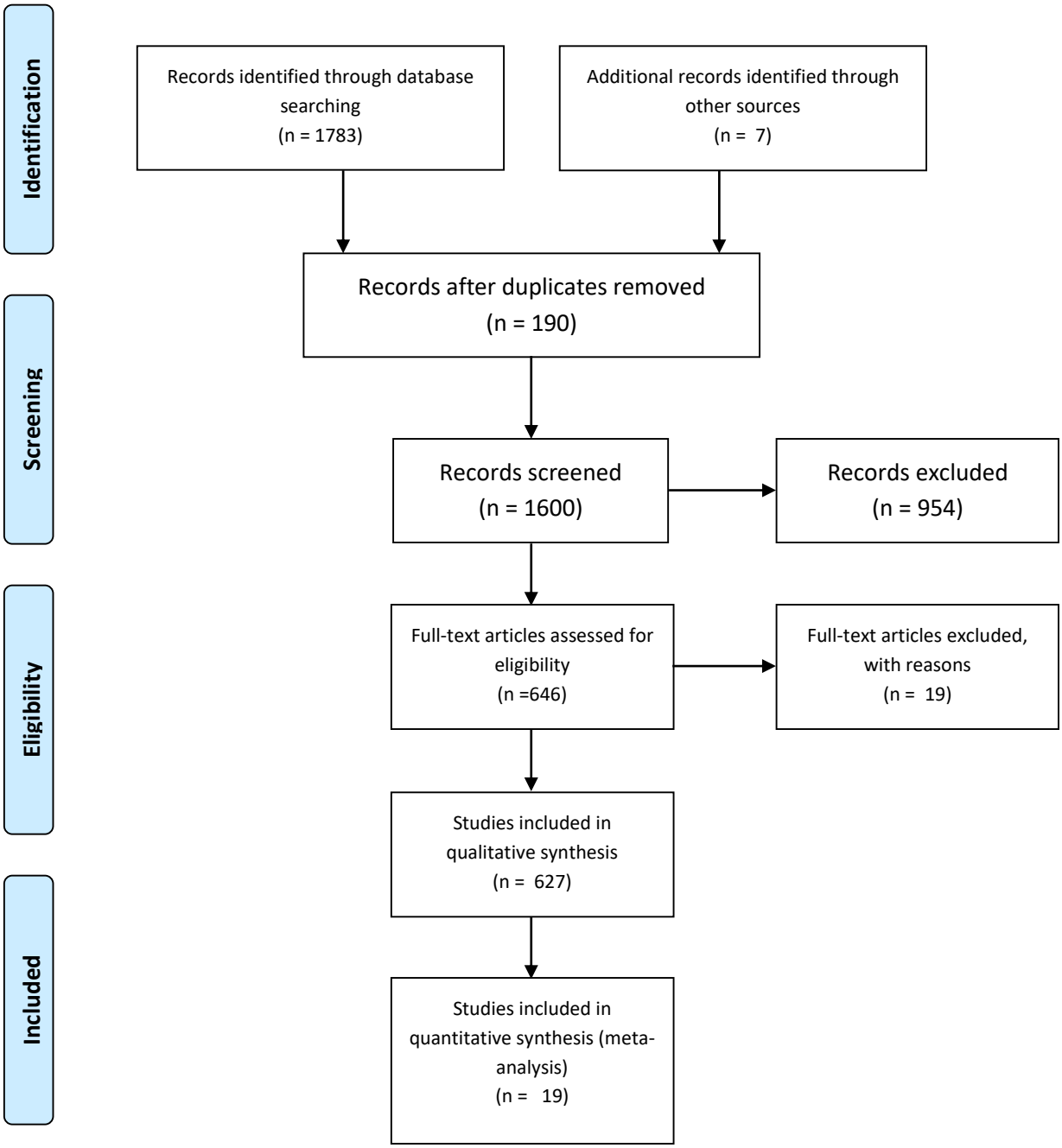

Figure 1. Flow diagram for study selection.

Data Extraction

The data was evaluated based on many items, including: study details, participants, type of intervention and intervention control conditions, evaluation scale and results. Although there is no source to determine the minimum number of articles required for meta-analysis, the present research literature introduces the minimum number of articles for meta-analysis as 3 articles (Davey et al., 2011). Therefore, only variables that had 3 or more studies related to the data were included in the analysis.

3. RESULTS

In this section, the average weight of each of the studies with their confidence interval is presented according to the findings (Figure 2).

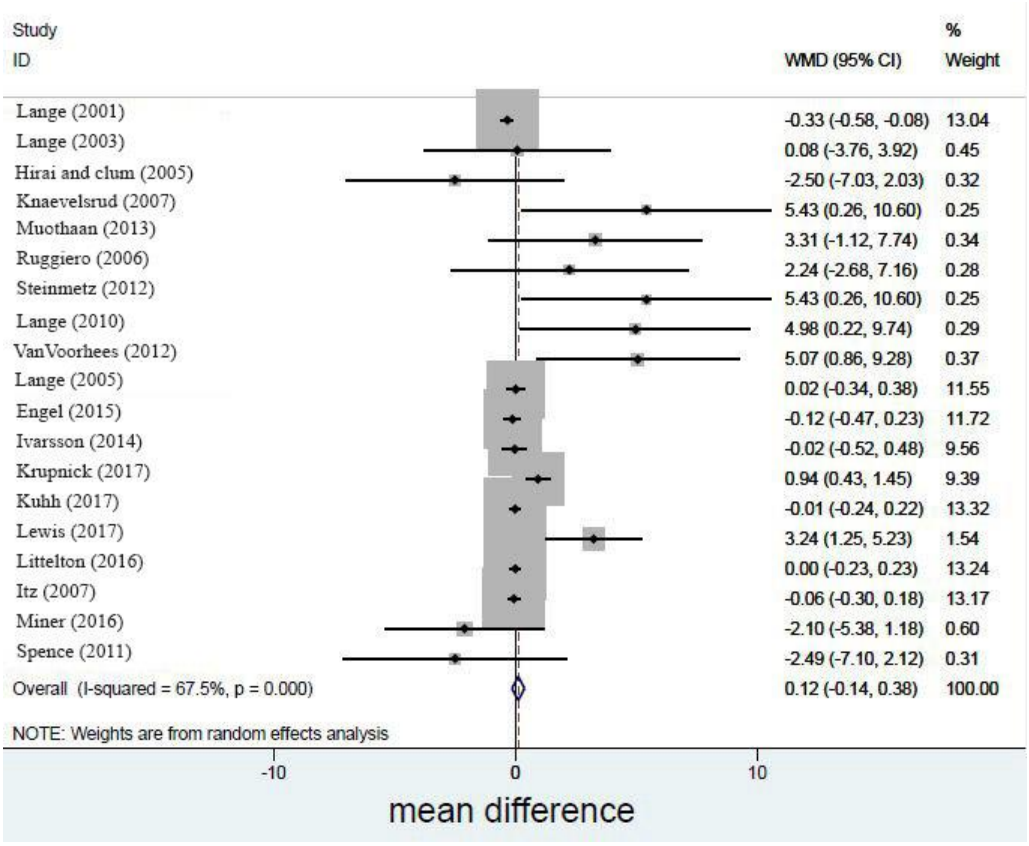

Figure 2. Forest plot diagram of the present study based on the effectiveness of online CBT for psychiatric disorders.

Meta-regression

For identifying the causes of heterogeneity, univariate meta-regression was used. mean age, sex,Year of publication, and duration of follow-up entered in the model and the parameters estimates by restricted maximum likelihood method. The result of meta-regression showed that year of publication was the most important source of heterogeneity (figure 3). There was a positive association between effect of PTSD and year of publication.

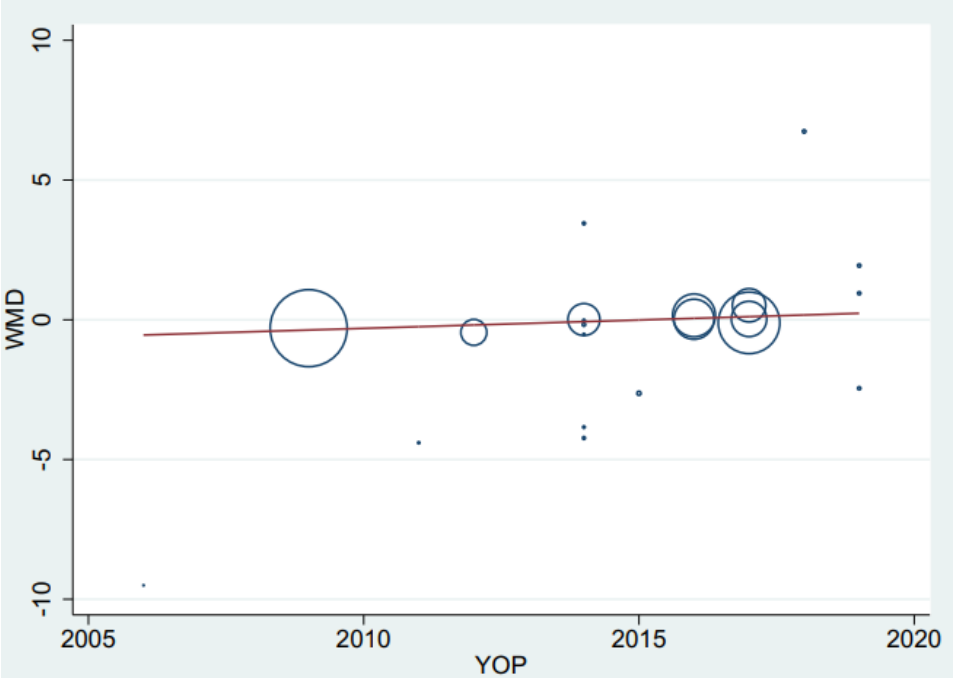

Figure 3. Results of Meta-regression between year of publication in studies and effect of NFB

Publication bias Assessment

The funnel plot, graphically, indicate no publication bias and shows symmetrical pattern. Additionally, both Egger's test (P-value=0.98) and Begg's test (P-value=0.23) indicated no publication bias (Figure 4).

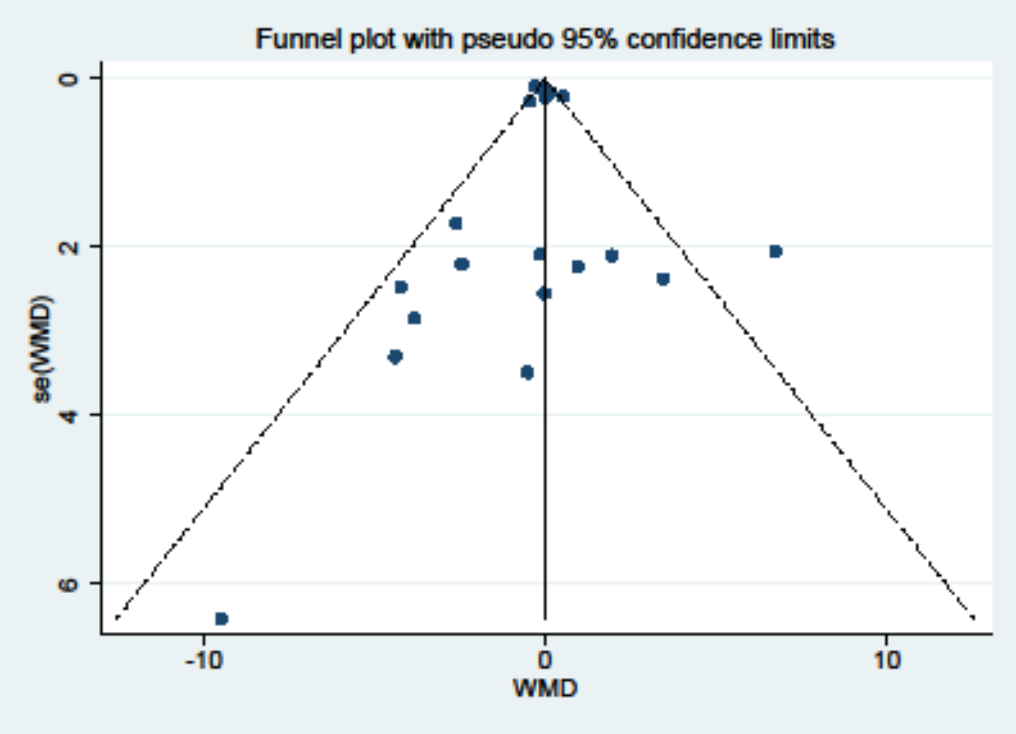

Figure 4. Funnel plot for publication bias assessment

4. DISCUSSION

In the meta-analysis method or analysis of the results from studies conducted in a particular field, the intervention method and its effectiveness are examined. In this method, a comprehensive view of effectiveness of the studied variables will be obtained. This unique method, which is based on unit being measured i.e. study, shows the evaluation rate and reliability of the variable (Gratzer et al., 2016).

The results of the meta-analysis do not provide convincing and satisfactory support for effectiveness of online cognitive-behavioral therapy for PTSD. This finding confirms the studies conducted in this field (Campos et al., 2018; Capaldi et al., 2016; Gaebel et al., 2017) and is inconsistent with results of some studies (Kazlauskas et al., 2016; Waller et al., 2009). One of the features of meta-analysis is that it can provide the possibility of comparing, repeating or changing specific treatment patterns. In this method, according to results of various studies, the authors can provide feedback to researchers about changing the format or form of a particular treatment. Also, by repeating a specific treatment pattern on different samples, a more general view of the specific treatment pattern can be obtained. In fact, the purpose of meta-analysis is to evaluate different therapeutic, educational, or diagnostic models over consecutive years and based on studies conducted in that field (Imel et al., 2013).

Given the clinical significance of ICBT for many victims, it should be noted that TF-CBT is not sponsored by any international mental health service provider in any country, and this complicates its reliability and authenticity a bit. However, ICBT is also considered as one of the significant and promising treatment options by therapists and has many advantages over other treatment access options due to its low cost and accessibility (Gratzer et al., 2016). ICBT also requires less face-to-face contact for treatment of PTSD than previous treatments, and many victims tend to benefit from off-site and less-contact treatments. However, most homework and ICBT assessments are primarily off-site. Only in limited cases face-to-face and in-person contact are necessary (Gratzer et al., 2016).

Among the studies, Knaevelstud and Steinmetz trials (WMD = 5.43) had the most influence. In this study, which was performed using an online cognitive-behavioral approach on PTSD victims, the effectiveness of ICBT was evaluated. According to the final results, the experimental group showed significant positive changes in reducing symptoms compared to control group. These results confirms the effectiveness of ICBT for PTSD. These findings and such recent studies have specific treatment guidelines for health care providers. Based on the power of these treatments in reducing symptoms, we can hope that this form of treatment will

become common. Notable points in these studies include codified self-reporting tools, continuous follow-up, efficient therapeutic communication, and adjusting the duration of sessions based on approved protocols approved by the WHO. In other clinical trials confirming the effectiveness of ICBT, emphasis on elements such as correct differential diagnosis, relaxation appropriate to the patient's condition, and complete conceptualization of treatment by the therapist can be seen.

Clinically, the control trials studied in this meta-analysis provided an ability to accurately assess ICBT due to high homogeneity of the samples. Since the same diagnosis and the same evaluation and follow-up of patients play a role in determining the results of the treatment of error and bias, this results includes no researcher bias and methodological assumptions.

It is worth noting that self-report tools in online interventions have always been criticized as one of weaknesses (Simon et al., 2019). In areas where self-report tools cannot show the accuracy of treatment information and feedback to the therapist, it is necessary to consider it as one of limitations of virtual therapies. Also, another challenging point in online treatments such as cognitive-behavioral interventions is general illiteracy and insufficient skills in using the desired programs to receive psychological services. This point has been specifically examined and challenged in some studies and is discussed as one of obstacles to development of online psychological services by experts (Rochlen et al., 2004). The nature of virtual therapies is a big challenge due to the lack of reporting or therapeutic understanding. Opponents of online therapies believe that in many cases the therapeutic connection is healing or helpful, and the content of the treatment is in the second place, so these therapies can be helpful only for educating and increasing mental health (Lewis et al., 2017; Littleton et al., 2016; Roberts et al., 2016). Lack of understanding between mental health professionals and policymakers in the ICBT principles is one of the obstacles to the development of online treatments and resistance against them. So, it is suggested that ICBT-related trials for other psychiatric disorders should be considered more broadly and more critical meta-analyses should be performed based on critical evaluation. Comparing the effectiveness of ICBT for various psychiatric disorders can be helpful in modifying the nature of the implementation and treatment of web-based protocols. Finally, it is suggested that those who are interested in ICBT focus on the reliability of diagnostic tools and follow-up in line with cyberspace patterns.

5. CONCLUSION

Due to the novelty of ICBT, it can be useful in explaining and analyzing the current treatment patterns. Despite these limitations of research in some articles in this study (such as lack of follow-up, self-report assessment tools), the results of some trials indicate that ICBT is one a reliable and appropriate treatment for PTSD, although overall meta-analysis results indicate limited effects. This form of treatment is available and less time consuming. It also can help health care system reduce treatment costs and increase the mental health of community.

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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